

Scrapiz: Design and Implementation of a Hybrid Waste Management Platform for General Scrap and Specialized Services

Prof. Mohammad Juned Shaikh¹, Prem Mandal², Manssori Abdur Rahim³

¹Guide, Dept. of Computer Engineering Rizvi College of Engineering Mumbai, India

^{2,3}Dept. of Computer Engineering Rizvi College of Engineering Mumbai, India

Abstract—The rapid urbanization in India has led to a significant increase in waste generation, yet the scrap collection industry remains largely unorganized. This sector suffers from critical inefficiencies, including a lack of price transparency, inconvenient scheduling, and a fragmented market where different vendors handle general scrap versus specialized services. Existing digital solutions often focus only on general household scrap, neglecting the high-value specialized service sector. This paper presents the design, development, and implementation of "Scrapiz," a comprehensive, hybrid waste management platform built using React Native. The system uniquely integrates two primary modules into a single mobile application: (1) a "Sell Scrap" module for general household and commercial items, featuring a 4-step booking process with transparent, pre-defined pricing, and (2) a "Services" module for specialized industrial and residential needs, including Demolition, Equipment Dismantling, Secure Paper Shredding, Society Tie-ups, and Junk Removal. The platform is architected as a two-app ecosystem (Client and future Vendor) and includes robust features such as order management, a referral wallet, and multi-channel customer support. The successful implementation of the client application validates the feasibility of this hybrid model, offering a unified and user-centric solution to a fragmented and unorganized industry.

Index Terms—Waste Management, Scrap Collection, Hybrid Model, React Native, Mobile Application, Price Transparency, Specialized Services, Expo.

I. INTRODUCTION

Waste management is one of the most significant logistical and environmental challenges facing urban India. The traditional scrap collection (Kabadiwala) system, while an integral part of the informal

economy, is fraught with problems. Customers face opaque and inconsistent pricing, an inability to schedule pickups at their convenience, and a general lack of professionalism. Furthermore, the market is highly fragmented; the vendor who collects old newspapers is different from the one who handles e-waste or large-scale junk removal. This fragmentation creates a gap in the market. While some digital platforms have emerged, they often focus on only one segment. This paper introduces "Scrapiz," a mobile platform designed to bridge this gap.

The primary contribution of this work is the design and implementation of a hybrid model that unifies general scrap collection (household/commercial) and specialized waste services into a single, seamless mobile application. Built with React Native for cross-platform (iOS and Android) compatibility, Scrapiz provides a one-stop solution for all waste-related needs. The system is built around five core modules accessible via a tab-bar navigation: Home, Sell, Services, Rates, and Profile. This paper details the architecture, implementation, and key features of the successfully developed client application.

II. LITERATURE REVIEW

The digitization of the waste sector is an active area of research. A prominent challenge is bringing transparency and efficiency to the collection of general household scrap.

Recent research, such as the "Online Kabadiwala" platform presented by Sharma et al. [1], has explored this domain. Their system proposes an Android and web platform for door-to-door recycling services. A key feature of their proposed system is the use of AI,

OpenCV, and large language models (LLMs) to analyze photographs of scrap uploaded by the user to determine its category, age, and estimated resale price. Their system also includes features like a "Used-Goods Store" for reselling items and a service-men allotment algorithm.

A. Identifying the Research Gap

While the approach in [1] is innovative in its use of AI for pricing general scrap, it overlooks a significant and unorganized part of the market: specialized, large-scale, or industrial services. There is a distinct lack of digital platforms that handle complex, high-value jobs such as building demolition, secure document shredding, or machinery dismantling.

Scrapiz addresses this gap directly. Instead of relying on AI for price estimation, Scrapiz provides upfront price transparency through a dedicated "Rates" module (see Fig. 1, bottom-left). More importantly, its hybrid model (see Fig. 1, middle-center) caters to *both* the general scrap market and the specialized service market, which, to our knowledge, is a novel approach in this domain.

III. SYSTEM ARCHITECTURE AND DESIGN

The Scrapiz platform is architected as a complete two-app ecosystem to manage the entire workflow between the customer and the service provider.

A. Overall Ecosystem

- Scrapiz Client App (Implemented):

The customer-facing mobile application (detailed in this paper) used for browsing services, viewing rates, and booking pickups.

- Scrapiz Vendor App (Future Scope):

A future application to be used by verified scrap vendors. This app will receive booking requests, manage pickups, and process payments.

B. Client Application Architecture (The 5-Tab Model)

The client app (shown in Fig. 1) is designed around a 5-tab bottom navigation bar for intuitive access to all core features.

1) Home (Fig. 1, top-center): A location-aware dashboard. It features a dual-function search bar, "Quick Actions" for selling scrap, and an "Impact" card that gamifies sustainability.

2) Sell (Fig. 1, top-right): The module for general household/commercial scrap collection. It guides the user through a 4-step booking process.

3) Services (Fig. 1, middle-center): The specialized services module, offering high-value services not found in typical scrap apps.

4) Rates (Fig. 1, bottom-left): A dedicated module for price transparency, listing all scrap items and their current market rates.

5) Profile (Fig. 1, bottom-right): The user management hub, handling authentication, address management, order history, and support.

C. Data Flow: The 4-Step Booking Process

The core workflow for the "Sell Scrap" module (Fig. 1, top-right) is a 4-step process:

1) Step 1: Select Items: The user browses a categorized list of scrap items (e.g., "Types of Metal Scrap") and adds items (e.g., "Iron," "Aluminum") to their cart. Prices are clearly displayed.

2) Step 2: Schedule Pickup: The user selects a convenient pickup date and a specific time slot (e.g., "Tue, Oct 21," "9:00 AM - 11:00 AM").

3) Step 3: Pickup Address: The user confirms their saved pickup address or adds a new one. This step also includes an "Upload Photos (Optional)" feature, which helps the vendor estimate the scrap volume.

4) Step 4: Order Summary: The user reviews all details: a list of items, the "Estimated Total" value, and an option to apply their "Referral Wallet" balance before confirming the booking.

IV. MODULES AND CORE FEATURES

The Scrapiz application integrates several key modules, validated by the implemented screenshots shown in Fig. 1.

A. Authentication and Onboarding

The app ensures a secure and modern entry point.

- Authentication (Fig. 1, top-left):

Provides robust sign-in/sign-up via Email/Password and **Google OAuth (SSO)**, enhancing user convenience and security.

B. Module 1: General Scrap ('Sell' Tab)

This module (Fig. 1, top-right) digitizes the traditional kabadiwala.

- Business Rules:

The app clearly defines its scope via a modal: it does not buy wood, glass, or clothes, and free pickup is only available above 15 kg.

- Booking Flow:

The 4-step process (detailed in Section III-D) ensures a smooth user experience.

C. Module 2: Specialized Services ('Services' Tab)

This is the platform's key differentiator (Fig. 1, middle-center), establishing the hybrid model.

- Service Catalog: This module offers five professional services, catering to B2B and large-scale B2C needs:

- 1) Demolition Service
- 2) Equipment and Machinery Dismantling
- 3) Secure Document Shredding
- 4) Society Tie-up (for residential complexes)
- 5) Household and Office Junk Removal

D. Module 3: Transparency ('Rates' Tab)

This module (Fig. 1, bottom-left) directly solves the problem of "price uncertainty".

- Live Price List: A dedicated screen shows a categorized list of all scrap items (Iron, Tin, Steel, etc.) with their exact price-per-kg.

- Dynamic Updates: The screen displays a "Last updated" timestamp, assuring users that the prices are current.

E. Module 5: User Engagement & Support

Scrapiz includes features to build user trust and retention.

- Refer & Earn System:

A complete referral system with a "Referral Wallet."

- Wallet Integration:

The referral bonus is not just a gimmick; it can be applied to bookings and is reflected in the final "Total Payout".

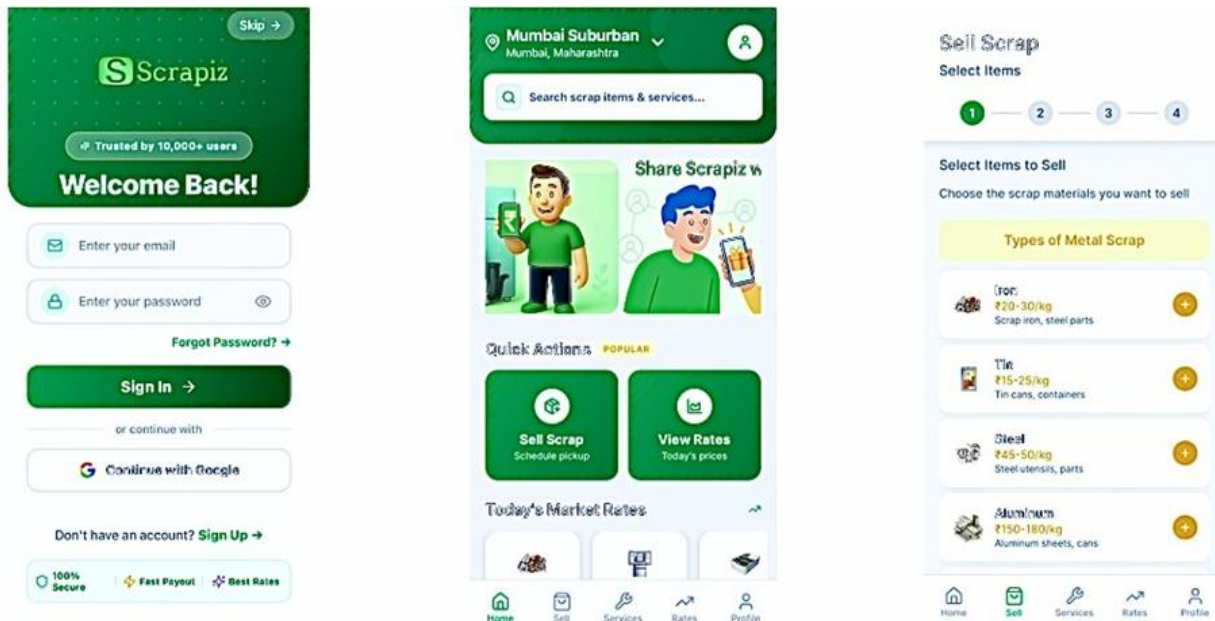
- Multi-Channel Support:

A professional "Help & Support" center (accessible via the Profile tab) offering support via Call, Email, and WhatsApp Chat.

V. IMPLEMENTATION AND RESULTS

The Scrapiz client application was successfully developed using the **React Native** framework with **Expo**, allowing for a single TypeScript codebase to be deployed to both iOS and Android.

The implemented screens (as referenced) serve as the primary result, validating that the proposed hybrid system is not merely conceptual but a functional, feature-rich application.



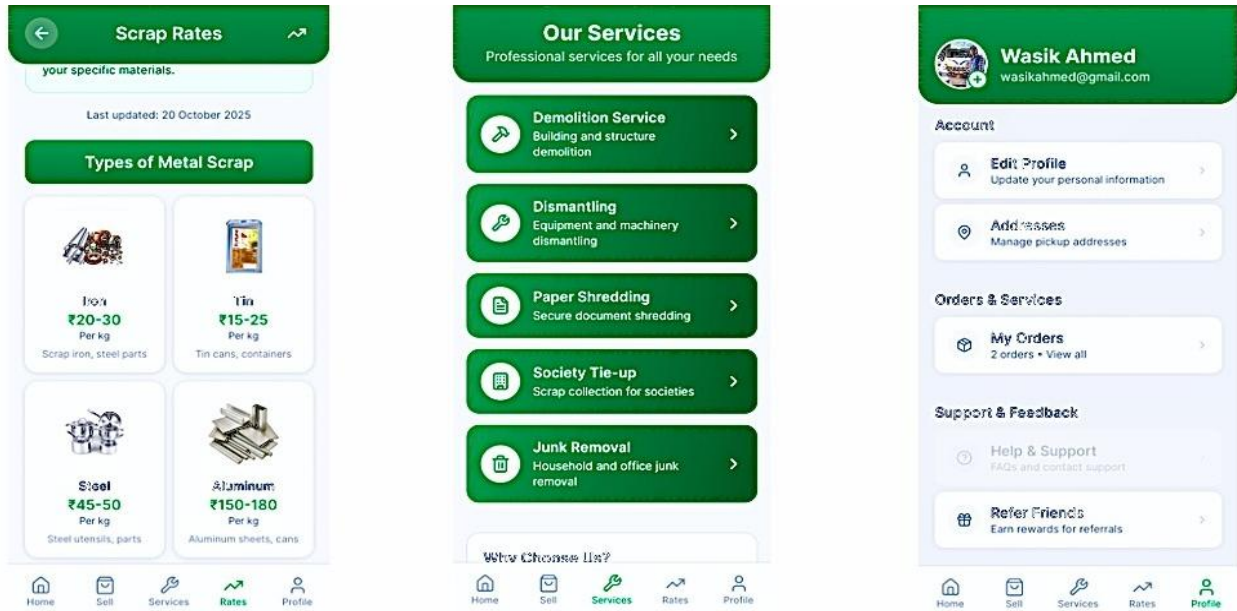


Fig. 1: Key screens of the Scrapiz Client Application: (Top-Left) Login, (Top-Center) Home Dashboard, (Top-Right) Sell Scrap Module, (Bottom-Left) Rates Module, (Middle-Center) Specialized Services Module, (Bottom-Right) Profile & Order Management.

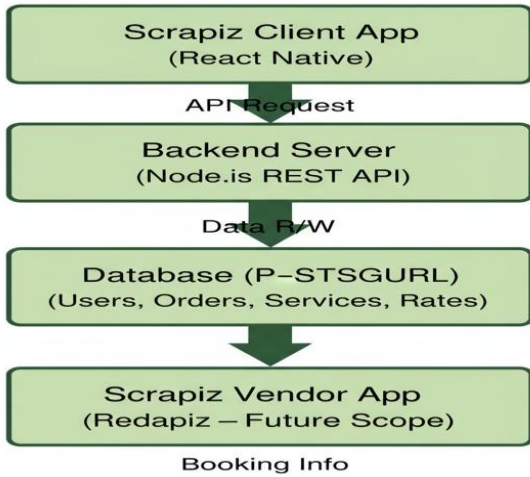


Fig. 2: Proposed Two-App System Architecture.

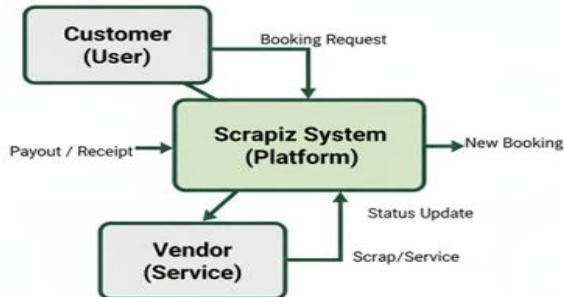


Fig. 3: Level 0 Data Flow Diagram (DFD) of the Ecosystem.

A. Discussion: Solving the Core Problems

The implemented Scrapiz platform directly addresses the problems identified in Section I:

- Problem: Scheduling Issues. Solution: The 4-step booking flow includes mandatory Date and Time Slot selection, giving control to the user.
- Problem: Price Uncertainty. Solution: The dedicated "Rates" tab (Fig. 1, bottom-left) and transparent pricing in the "Sell" tab (Fig. 1, top-right) eliminate ambiguity *before* booking. This contrasts with the AI-based estimation model of [1], which is reactive.
- Problem: Fragmented Market. Solution: The Hybrid Model (Fig. 1, middle-center) is the core innovation. A user can book a pickup for old newspapers *and* schedule a demolition service from the same application.

The platform's UI/UX, with its clean design, 5-tab navigation (Fig. 1, top-center), and features like Google OAuth (Fig. 1, top-left) and impact tracking, demonstrates a modern, user-centric approach that builds trust and encourages adoption.

VI. CONCLUSION AND FUTURE WORK

A. Conclusion

This paper presented the design and implementation of

Scrapiz, a hybrid mobile platform for waste management. By successfully integrating a general scrap collection module with a specialized services module, Scrapiz provides a unique, comprehensive, and unified solution to a fragmented and un-organized sector. The implementation of the client application, with its focus on price transparency, user convenience, and a rich feature set, validates the feasibility and superiority of this hybrid model over single-focus scrap applications.

B. Future Work

The completion of the client application lays the ground- work for the second phase of the project, which will focus on building the complete ecosystem:

- 1) Scrapiz Vendor App: Development of the dedicated application for vendors to receive and manage bookings.
- 2) Smart Allotment Algorithm: Implementation of a location-based algorithm (as discussed in [1]) to automatically route a client's booking to the nearest available vendor.
- 3) Payment Gateway Integration: Integrating a secure payment system into the Vendor App to facilitate direct, online vendor-to-customer payouts, which will also seamlessly process the user's Referral Wallet balance.

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